

1 **WHAT IS CLAIMED IS:**

2 1. An isolated nucleic acid molecule selected from the group consisting of:

3 a) a nucleic acid molecule having a nucleotide sequence which is at least 90% identical to  
4 the nucleotide sequence of Chlamydomonas intraflagellar transport (IFT) particle protein gene  
5 20, 27, 46, 52, 57, 72, 88, 122, 139, or Che-2, or a complement thereof;

6 b) a nucleic acid molecule comprising at least 15 nucleotide residues and having a  
7 nucleotide sequence identical to at least 15 consecutive nucleotide residues of the nucleotide  
8 sequence of Chlamydomonas IFT particle protein gene 20, 27, 46, 52, 57, 72, 88, 122, or 139, or  
9 Che-2, or a complement thereof;

10 c) a nucleic acid molecule which encodes a polypeptide comprising the amino acid  
11 sequence of Chlamydomonas IFT particle protein 20, 27, 46, 52, 57, 72, 88, 122, 139, or Che-2;  
12 or

13 d) a nucleic acid molecule which encodes a polypeptide comprising at least 10 amino  
14 acids and having an amino acid sequence identical to at least 10 consecutive amino acids of the  
15 amino acid sequence of Chlamydomonas IFT particle protein 20, 27, 46, 52, 57, 72, 88, 122,  
16 139, or Che-2.

17  
18 2. The isolated nucleic acid molecule of claim 1, which is selected from the group  
19 consisting of:

20 a) a nucleic acid having the nucleotide sequence of Chlamydomonas IFT particle protein  
21 gene 20, 27, 46, 52, 57, 72, 88, 122, 139, or Che-2, or a complement thereof; and

22 b) a nucleic acid molecule which encodes a polypeptide having the amino acid sequence  
23 of Chlamydomonas IFT particle protein 20, 27, 46, 52, 57, 72, 88, 122, 139, or Che-2.

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25 3. The nucleic acid molecule of claim 1, further comprising nucleic acid sequences  
26 encoding a heterologous polypeptide.

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28 4. A vector comprising the nucleic acid molecule of claim 1.

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30 5. A host cell comprising the nucleic acid molecule of claim 1.

- 31
- 32 6. The host cell of claim 5, wherein the host cell is a non-human mammalian host cell.
- 33
- 34 7. An isolated polypeptide selected from the group consisting of:
- 35 a) a polypeptide comprising at least 10 amino acids and having an amino acid sequence
- 36 identical to at least 10 consecutive amino acids of the amino acid sequence of Chlamydomonas
- 37 intraflagellar transport (IFT) particle protein 20, 27, 46, 52, 57, 72, 88, 122, 139, or Che-2;
- 38 b) a polypeptide comprising the amino acid sequence of Chlamydomonas IFT particle
- 39 protein 20, 27, 46, 52, 57, 72, 88, 122, 139, or Che-2, wherein the polypeptide comprises one or
- 40 more conservative amino acid substitutions that do not inhibit the biological activity of the
- 41 polypeptide relative to a corresponding native Chlamydomonas IFT particle protein; and
- 42 c) a polypeptide which is encoded by a nucleic acid molecule comprising a nucleotide
- 43 sequence which is at least 90% identical to a nucleic acid consisting of the nucleotide sequence
- 44 of Chlamydomonas IFT particle protein gene 20, 27, 46, 52, 57, 72, 88, 122, 139, or Che-2, or a
- 45 complement thereof.
- 46
- 47 8. The isolated polypeptide of claim 7, comprising the amino acid sequence of
- 48 Chlamydomonas IFT particle protein 20, 27, 46, 52, 57, 72, 88, 122, 139, or Che-2.
- 49
- 50 9. The polypeptide of claim 7, wherein the polypeptide further comprises heterologous
- 51 amino acid residues.
- 52
- 53 10. An antibody that selectively binds to the polypeptide of claim 7.
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- 55 11. An antibody that selectively binds to the polypeptide of claim 8.
- 56
- 57 12. An isolated nucleic acid molecule selected from the group consisting of:
- 58 a) a nucleic acid molecule having a nucleotide sequence which is at least 90% identical to
- 59 the nucleotide sequence of mouse intraflagellar transport (IFT) particle protein gene 57, or a
- 60 complement thereof;

b) a nucleic acid molecule comprising at least 15 nucleotide residues and having a nucleotide sequence identical to at least 15 consecutive nucleotide residues of the nucleotide sequence of mouse IFT particle protein gene 57, or a complement thereof;

c) a nucleic acid molecule which encodes a polypeptide comprising the amino acid sequence of mouse IFT particle protein 57; or

d) a nucleic acid molecule which encodes a polypeptide comprising at least 10 amino acids and having an amino acid sequence identical to at least 10 consecutive amino acids of the amino acid sequence of mouse IFT particle protein 57.

13. The isolated nucleic acid molecule of claim 12, which is selected from the group consisting of:

a) a nucleic acid having the nucleotide sequence of mouse IFT particle protein gene 57 or a complement thereof; and

b) a nucleic acid molecule which encodes a polypeptide having the amino acid sequence of mouse IFT particle protein 57.

14. An isolated polypeptide selected from the group consisting of:

a) a polypeptide comprising at least 10 amino acids and having an amino acid sequence identical to at least 10 consecutive amino acids of the amino acid sequence of mouse intraflagellar transport (IFT) particle protein 57;

b) a polypeptide comprising the amino acid sequence of mouse IFT particle protein 57, wherein the polypeptide comprises one or more conservative amino acid substitutions that do not inhibit the biological activity of the polypeptide relative to native mouse IFT particle protein 57; and

c) a polypeptide which is encoded by a nucleic acid molecule comprising a nucleotide sequence which is at least 90% identical to a nucleic acid consisting of the nucleotide sequence of mouse IFT particle protein gene 57, or a complement thereof.

15. The isolated polypeptide of claim 14, comprising the amino acid sequence of mouse IFT particle protein 57.

122           contacting the candidate modulator to a culture of cells comprising non-functional cilia  
 123           and lacking a specific IFT particle protein, and  
 124           determining whether the candidate modulator restores cilia function, wherein restoration  
 125           of cilia function indicates the candidate modulator is an IFT particle protein restorative agent.

126  
 127           23. A method for identifying a candidate compound that restores the activity of a  
 128           defective or absent human intraflagellar transport (IFT) particle protein, the method comprising:  
 129           obtaining a mixture of isolated IFT particle polypeptides that comprises (i) all but one of  
 130           the IFT particle polypeptides required to form the IFT particle, and (ii) a medium that enables the  
 131           IFT particle polypeptides to form the IFT particle when all normal IFT particle polypeptides that  
 132           constitute that IFT particle are present;

133           contacting a test compound to the mixture; and  
 134           determining whether the test compound enables the IFT particle to be formed, wherein  
 135           IFT particle formation indicates the test compound is a candidate compound that restores the  
 136           activity of a defective or absent human IFT particle protein.

137  
 138           24. The method of claim 23, further comprising  
 139           contacting the candidate compound to a culture of cells comprising non-functional cilia  
 140           and lacking a specific IFT particle protein, and  
 141           determining whether the candidate compound restores cilia function, wherein restoration  
 142           of cilia function indicates the candidate compound is an IFT particle protein restorative agent.

143  
 144           25. The method of claim 23, wherein the human IFT particle polypeptide is selected  
 145           from the group consisting of human IFT particle polypeptides 20-1, 20-2, 20-3, 27, 46, 52, 57-1,  
 146           57-2, 72, 88, 122, 139-1, 139-2 and Che-2.

147  
 148           26. A method of diagnosing a disorder in a tissue in a subject caused by a defective or  
 149           absent human intraflagellar transport (IFT) particle protein, the method comprising  
 150           obtaining a sample of cells from the tissue;  
 151           disrupting the cells;

92 16. A method for identifying a candidate compound that modulates the activity of mouse  
93 intraflagellar transport (IFT) particle protein 57, the method comprising:

94 contacting a test compound to an isolated IFT particle polypeptide of claim 14; and  
95 determining whether the test compound interacts with the polypeptide, wherein  
96 interaction indicates that the test compound is a candidate modulator of mouse IFT particle  
97 protein 57.

98  
99 17. A method for identifying a candidate compound that modulates the activity of a  
100 human intraflagellar transport (IFT) particle protein, the method comprising:

101 contacting a test compound to an isolated IFT particle polypeptide; and  
102 determining whether the test compound interacts with the polypeptide, wherein  
103 interaction indicates that the test compound is a candidate modulator of a human IFT particle  
104 protein.

105  
106 18. The method of claim 17, wherein the isolated human IFT particle polypeptide is  
107 selected from the group consisting of human IFT particle polypeptide 20-1, 20-2, 20-3, 27, 46,  
108 52, 57-1, 57-2, 72, 88, 122, 139-1, 139-2 and Che-2.

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110 19. The method of claim 17, wherein the test compound binds to the isolated IFT particle  
111 polypeptide and wherein the modulation is inhibition of activity.

112  
113 20. The method of claim 17, wherein the test compound binds to the isolated IFT particle  
114 polypeptide and wherein the modulation is increasing activity.

115  
116 21. The method of claim 17, further comprising  
117 contacting the candidate modulator to a culture of cells comprising functional cilia, and  
118 determining whether the candidate modulator inhibits cilia function, wherein inhibition of  
119 cilia function indicates the candidate modulator is an IFT particle protein inhibitory agent.

120  
121 22. The method of claim 17, further comprising

152 contacting the disrupted cell sample with an antibody that specifically binds to a normal  
153 human IFT particle protein; and

154 detecting binding of the antibody to any IFT particle protein in the sample, wherein  
155 absence of binding indicates that the tissue has a disorder caused by a defective or absent IFT  
156 particle protein.

157  
158 27. The method of claim 26, wherein the disorder is kidney disease, retinal disorder,  
159 thyroid disorder, chondrocyte disease, olfactory disease, azoospermia, or primary ciliary  
160 dyskinesia.

161  
162 28. A method of treating a disorder in a subject caused by a defective or absent  
163 intraflagellar transport (IFT) protein, the method comprising administering to the subject a  
164 human IFT particle polypeptide in an amount effective to restore the function of the defective or  
165 absent IFT particle protein.

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167 29. The method of claim 28, wherein administering the human IFT particle polypeptide  
168 comprises administering a nucleic acid that encodes a human IFT particle polypeptide.

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170 30. The method of claim 28, wherein the human IFT particle polypeptide is selected  
171 from the group consisting of human IFT particle polypeptides 20-1, 20-2, 20-3, 27, 46, 52, 57-1,  
172 57-2, 72, 88, 122, 139-1, 139-2 and Che-2.

173  
174 31. A method of treating an infection in a subject caused by a pathogen that comprises a  
175 intraflagellar transport (IFT) particle protein, the method comprising administering to the subject  
176 an effective amount of an agent that inhibits the function of the IFT particle protein.

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178 32. The method of claim 31, wherein the agent is an antibody that binds specifically to  
179 the IFT particle protein.

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181 33. The method of claim 31, wherein the subject is a mammal.

183 34. The method of claim 31, wherein the subject is a human.

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185 35. The method of claim 31, wherein the subject is a plant.

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187 36. The method of claim 31, wherein the pathogen is a nematode, insect, protozoa  
188 bacteria.

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[illegible]